



PATENT  
P56310

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES**

In re Application of:

Appeal No. \_\_\_\_\_

JAE-HO MOON *et al.*

Serial No.: 09/782,029

Examiner: HUFFMAN, J.

Filed: February 14, 2001

Art Unit: 2853

For: INK-JET PRINTHEAD

Attn: Board of Patent Appeals & Interferences

**APPEAL BRIEF**

**Mail Stop Appeal Brief-Patents**

Commissioner for Patents

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Sir:

Pursuant to Appellant's Notice of Appeal filed on 27 October 2003, Appellant hereby appeals to the Board of Patent Appeals and Interferences from the final rejection of independent claims 3, 6, and 27, as set forth in the Advisory Action mailed on 21 October 2003 (Paper No. 17) and Paper No. 14 mailed June 26, 2003. The remaining pending claims, claims 36 and 37, have been allowed as set forth in Paper No. 17.

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Date: 12/19/03

I.D.: REB/ML/kf/rfc

## **I. REAL PARTY IN INTEREST**

Pursuant to 37 CFR §1.192(c)(1)(as amended), the real party in interest is:

SamSung Electronics Co., Ltd.  
#416, Maetan-dong, Paldal-gu  
Suwon-city, Kyungki-do, Republic of KOREA

as evidenced by the Assignment executed by the inventor on 12 February 2001 and recorded in the U.S. Patent & Trademark Office on 14 February 2001 at Reel 011546, frame 0952.

## **II. RELATED APPEALS AND INTERFERENCES**

There are no other appeals and no interferences known to Appellant, Appellant's legal representatives or the assignee which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

## **III. STATUS OF CLAIMS**

Independent claims 3, 6, and 27 stand finally rejected. Of all pending claims, claims 3, 6, 27, 36 and 37, claims 36 and 37 are allowed as stated in the Advisory Action (Paper No. 17). Claims 1, 2, 4, 5, 7 through 26, 28 through 35 and 38 through 51 have been previously canceled.

## **IV. STATUS OF AMENDMENTS**

An Amendment requesting amendment of claims 3, 6, 27, and 36, and cancellation of claims 2, 9, and 23 through 25, was filed on 23 September 2003 subsequent to the final rejection dated 26 June 2003 (Paper No. 14). The Amendment of 23 September 2003 was entered for the purpose of

appeal as set forth in the Advisory Action mailed on 21 October 2003 (Paper No. 17). No non-appeal response to Paper No. 17 was ever filed.

## V. SUMMARY OF INVENTION

The present invention relates to a novel structure for an ink-jet printhead where the novel structure effectively prevents a back flow of ink due to the expansion pressure of a bubble. In particular, the novel structure includes a truncated shaped conical nozzle hole or chamber-orifice hole disposed above an ink feed groove and a heater. The heater surrounds the ink feed hole. Nozzle hole has its own ink feed hole. The positioning and structure of the nozzle hole, the ink feed hole and the resistor reduce back flow during ink ejection.

## VI. ISSUES

1. Whether claim 3 was improperly rejected under 35 U.S.C. § 103 for alleged unpatentability over Sato (JP 404161340A) or Sato '340 and USP 3,949,410 of Bassous *et al.* '410, and in view of U.S. Patent No. 4,914,562 to Nobumasa Abe *et al.* In particular, whether or not there is sufficient motivation to allow combine Abe '562 with Sato '340 and/or Bassous '410.

2. Whether claim 6 was improperly rejected under 35 U.S.C. § 103 for alleged unpatentability over Japanese Patent Publication No. 04-161340 to Tsutomu SATO in view of U.S. Patent No. 3,949,410 to Ernest Bassous *et al.* In particular, whether FIG. 1 of Sato '340 teaches a nozzle hole having a truncated conical shape.

3. Whether claim 27 was improperly rejected under 35 U.S.C. § 103 for alleged

unpatentability over U.S. Patent No. 6,045,214 to Ashok Murthy *et al.* in view of Bassous *et al.* '410. In particular, whether or not FIG. 1 of Murthy '214 teaches each nozzle hole corresponding to at least one ink feed hole.

First and Surnames of the inventors for the above prior art were used as the Examiner mischaracterized JP-404161340 as Tsutomu '340 and not Sato '340. Tsutomu is the inventor's first name and Sato is the inventor's last name. Therefore, JP 404161340 is correctly referred to as Sato '340.

## **VII. GROUPING OF THE CLAIMS**

None of the appealed claims 3, 6 and 27 stand or fall together, and thus the fate of each of claims 3, 6 and 27 are to be decided independently from each other. Claim 3 is grouped separately from claim 6, claim 6 is grouped separately from claim 27 and claim 3 is grouped separately from claim 27.

## **VIII. ARGUMENTS**

### **A. GROUPING**

**Regarding the lack of grouping of rejected claims 3, 6 and 27,** Appellant did not group any of these claims together because each of these claims had a separate grounds for rejection in the Final Office action of Paper No. 14. Claim 3 was rejected using a Sato '340 in view of Bassous '410

further in view of Abe '562. Claim 6 was rejected using Sato '340 and Bassous '410 only. Claim 27 was rejected using Murthy '214 in view of Bassous '410. Because each of these three claims had a separate grounds for rejection using a different combination of prior art, Appellant has grouped claims 3, 6 and 27 separately standing and falling on their own and not together.

Appellant has grouped claims 3, 6 and 27 separately also because the issues for appeal for the rejection of each of these three claims is diverse and entirely unrelated to each other. For example, the issue with the rejection of claim 3 is the lack of motivation to combine Abe '562 with either Sato '340 or Bassous '410. The issue regarding claim 6 is whether FIG. 1 of Sato '340 illustrates a nozzle hole having a truncated conic shape. The issue regarding claim 27 is whether FIG. 1 of Murthy '214 illustrates a one to one correspondence between the nozzle holes and the ink feed holes. Since all three of these issues are unrelated to each other, claims 3, 6 and 27 have been grouped separately.

## **B. REJECTION OF CLAIMS 3, 6 AND 27**

**Regarding the claim 3 final rejection,** Appellant claims, "wherein each one of said plurality of heaters is of an omega shape that surrounds said corresponding ink feed hole". In Paper No. 14, the Examiner relies on FIG. 17c of Abe '562 for a teaching of an omega-shaped heater. The purpose of the heater shape of FIG. 17c of Abe '562 is to prevent cavitation damage at a center of a heater resistor caused by a collapsing bubble. Then, in Paper No. 14, the Examiner justifies using Abe '562 to fill in for the deficiencies of Sato '340 and Bassous '410 for the purpose of preventing cavitation

damage to the heater. Appellant disagrees.

Appellant submits that one having ordinary skill in the art would not be motivated to turn to Abe '562 to fill in for the deficiencies of either 1) Sato '340, 2) Bassous '410 and/or 3) the combination of Sato '340 and Bassous '410. Appellant therefore submits that the motivation to combine requirement of MPEP 2143.01 for a 35 U.S.C. 103 rejection of claim 3 has not been met.

Appellant submits that Sato '340, like Appellant's invention, has an ink feed hole at the geometric center of the heater and the ink chamber. Therefore, if a bubble were to collapse in Sato '340, there is no possibility that a heater could be subject to cavitation damage as a collapsing bubble in Sato '340 would collapse on the ink feed hole where it is impossible to have resistive heater material present. Because cavitation damage cannot be an issue in Sato '340, Appellant submits that one having ordinary skill in the art would not be motivated to turn to Abe '562, and in particular, FIG. 17c of Abe '562 to fill in for the deficiencies of Sato '340. Because there is no motivation to combine Abe '562 with Sato '340, the rejection to claim 3 cannot be valid.

Appellant also submits that one having ordinary skill in the art would not be motivated to use Abe '562 to fill in for the deficiencies of Bassous '410. This is because Bassous '410 does not generate a bubble to eject ink. Instead, Bassous '410 ejects ink electrohydrodynamically. Since Bassous '410 does not produce a bubble, there is no collapsing bubble in Bassous '410 after ejection of an ink droplet. Because there is no collapsing bubble in Bassous '410, there is no cavitation

issues in Bassous '410. Because there is no cavitation issues in Bassous '410, there is no motivation to turn to Abe '562 to employ a heater design that prevents cavitation damage to the heater and use it in the designs of Bassous '410. Therefore, one having ordinary skill in the art would not turn to Abe '562 to fill in for the deficiencies of Bassous '410. Therefore, the rejection to claim 3 is invalid.

In Paper No. 17, the Examiner responded to the above argument by stating that Bassous '410 and Abe '562 are both modifying Sato '340 and that Abe '562 is not modifying Bassous '410. However, Appellant is submitting that MPEP 2143.01 requires a motivation to combine references when a 35 U.S.C. 103 rejection is being made. Since Sato '340 is the base reference and Bassous '410 and Abe '562 are secondary references, the Examiner must show why one having ordinary skill in the art would be motivated to turn to Abe '562 to fill in for the deficiencies of either Sato '540 or Bassous '410 or the combination of Sato '340 and Bassous '410. In the prosecution history of this patent application, the Examiner never has shown why one having ordinary skill in the art would be motivated to turn to Abe '562. Furthermore, Appellant has demonstrated why one having ordinary skill in the art would not be motivated to turn to Abe '562 to fill in for the deficiencies of either Sato '340 alone or Bassous '410 or the combination of Sato '340 and Bassous '410. Because the 35 U.S.C. 103 rejection lacks the requisite motivation to combine, the rejection of claim 3 is entirely defective.

**Regarding the claim 6 final rejection,** Appellant claims each chamber-orifice complex hole to have "a truncated conical shape". In Paper Nos. 14 & 17, the Examiner relies on FIG. 1 of Sato

'340 for a teaching of a truncated conical shaped chamber-orifice complex hole. Appellant disagrees.

As previously argued in Appellant's response to Paper No. 14 filed on September 23, 2003, Appellant submits that the nozzle holes in FIG. 1 of Sato '340 are not conic. Despite the Examiner's contrary opinion expressed in Paper No. 17, Appellant submits that "conic" means "cone". Furthermore, Appellant submits that a "cone" is a solid formed by rotating a **straight line, not a curved line as in FIG. 1 of Sato '340**. Appellant submits that since the nozzle holes in FIG. 1 of Sato '340 are formed by rotating a curved line and not a straight line, FIG. 1 of Sato '340 does not teach a conic nozzle hole and thus does not meet the claim language of Appellant's claim 6.

In the attached comments to Paper No. 17, the Examiner disputed Appellant's assertion that a cone is a three dimensional solid formed by a rotating a straight line and that a "cone" does not include solids formed by rotating curved lines. In the comments attached to Paper No. 17, the Examiner stated that it is only a "right circular cone" instead of a just plane "cone" that is a volume formed from the rotation of a straight line and not a curved line. Appellant disagrees. Appellant submits that a "cone" means a solid formed by the rotation of a straight line and not a solid formed by the rotation of a curved line.

To support Appellant's assertion that a cone means a solid formed by rotating a straight rather than a curved line, Appellant is submitting definitions of the word "cone" from a number of



sources. These sources include: 1) page 291 of Webster's New World Dictionary Third College Edition 1988, 2) page 474 of Webster's Third New International Dictionary unabridged 1986, 3) The American Heritage Dictionary of the English Language: Fourth Edition, 2000 found at <http://www.bartleby.com/61/68/C0556800.html>, and 4) Eric Weisstein's World of Mathematics found at <http://mathworld.wolfram.com/Cone.html>. In the case of references 1-3 above, a "cone" is defined explicitly as a solid formed by the rotation of a straight line. In the case of the fourth reference, a cone is defined as a pyramid with a circular cross section. The fourth source then defines a pyramid as a "polyhedron", which is defined using triangles. Since triangles have straight sides and not curved sides, and since a cone is formed from a triangle, Appellant submits that the fourth reference, like references 1-3 above, define a cone to be formed from rotating a straight line and not formed from rotating curved lines. Therefore, Appellant submits that FIG. 1 of Sato '340 fails to meet Appellant's claim 6 limitation that the chamber-orifice holes have a truncated conical shape.

**Regarding the claim 27 final rejection**, Appellant claims, "wherein each chamber-orifice complex hole corresponds to at least one of said plurality of ink feed holes". In Paper No. 14, the Examiner indicates that FIG. 1 of Murthy '214 teaches this feature without any more guidance as to exactly what reference numerals or line or column numbers in Murthy '214 teach this feature.

It is kindly noted that FIG. 1 of Murthy '214 is a cross section of FIG. 2 which shows seven nozzle holes 18 that correspond to one ink supply 24. Because there are fewer ink supply holes 24

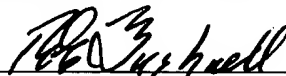
than nozzle holes 18 in Murthy '214, Appellant submits that Murthy '214 is lacking the one-to-one correspondence between the chamber-orifice holes and the ink feed holes that Appellant is claiming. Because neither Murthy '214 nor Bassous '410 teach this feature of Appellant's claim 27, the rejection of claim 27 in Paper No. 14 cannot stand.

## **IX. CONCLUSION**

Appellant has shown why the final rejections to each of claims 3, 6 and 27 should be reversed. Regarding claim 3, Appellant submits that the references cannot be combined as in Paper No. 143 because of a lack of motivation. For claims 6 and 27, Appellant submits that the prior art references do not teach the claimed feature in dispute.

In view of the law and facts stated herein, as well as all of the foregoing reasons, Appellant believes that the rejection is improper, and respectfully requests that the Board refuse to sustain the outstanding rejection of claims 3, 6, and 27 under 35 U.S.C. § 103.

Respectfully submitted,



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## **X. APPENDIX**

### **CLAIMS UNDER APPEAL (claims 3, 6, and 27)**

1           3. (Once Amended) An ink-jet printhead, comprising:

2           a substrate being a single integrated monolithic and homogenous unit of silicon, said  
3           substrate, having a rear surface, said rear surface having a channel having a predetermined depth,  
4           wherein a plurality of ink feed holes are formed on a bottom of the channel perforating said  
5           substrate;

6           a nozzle plate coupled to a front surface of the substrate, said nozzle plate being perforated  
7           by a plurality of chamber-orifice complex holes, wherein each chamber-orifice complex hole  
8           corresponds to at least one of said plurality ink feed holes; and

9           a plurality of heaters disposed on the front surface of the substrate, each one of said plurality  
10          of heaters being located near corresponding ones of said plurality of chamber-orifice complex holes,  
11          wherein each one of said plurality of ink feed holes is formed at a center portion of a corresponding  
12          one of said plurality of chamber-orifice complex holes, and each one of said plurality of said heaters  
13          surrounds corresponding ones of said plurality of ink feed holes, wherein each one of said plurality  
14          of heaters is of an omega shape that surrounds said corresponding ink feed hole.

1           6. (Once Amended) An ink-jet printhead, comprising:

2           a substrate being a single integrated monolithic and homogenous unit of silicon, said  
3           substrate, having a rear surface, said rear surface having a channel having a predetermined depth,  
4           wherein a plurality of ink feed holes are formed on a bottom of the channel perforating said

5 substrate;

6 a nozzle plate coupled to a front surface of the substrate, said nozzle plate being perforated  
7 by a plurality of chamber-orifice complex holes, wherein each chamber-orifice complex hole  
8 corresponds to at least one of said plurality ink feed holes; and

9 a plurality of heaters disposed on the front surface of the substrate, each one of said plurality  
10 of heaters being located near corresponding ones of said plurality of chamber-orifice complex holes,  
11 wherein each one of said plurality of ink feed holes is formed at a center portion of a corresponding  
12 one of said plurality of chamber-orifice complex holes, and each one of said plurality of said heaters  
13 surrounds corresponding ones of said plurality of ink feed holes, wherein each chamber-orifice has  
14 a truncated conical shape, wherein a lower end of said chamber orifice facing said substrate faces  
15 the corresponding ink feed hole and heater formed on the substrate and the other end having a  
16 smaller diameter faces toward an outside of said ink-jet printhead.

1 27. (Thrice Amended) An ink-jet printhead, comprising:

2 a substrate being a single integrated monolithic and homogenous unit of silicon, said  
3 substrate, having a rear surface, said rear surface having a channel having a predetermined depth,  
4 wherein a plurality of ink feed holes are formed on a bottom of the channel perforating said  
5 substrate;

6 a nozzle plate coupled to a front surface of the substrate, said nozzle plate being perforated  
7 by a plurality of chamber-orifice complex holes, wherein each chamber-orifice complex hole  
8 corresponds to at least one of said plurality of ink feed holes; and

9 a plurality of heaters disposed on the front surface of the substrate, each one of said plurality  
10 of heaters being located near corresponding ones of said plurality of chamber-orifice complex holes,  
11 said nozzle plate being a single integrated monolithic and homogenous unit, each chamber-orifice  
12 hole having a cylindrical shaped portion on a portion of said chamber-orifice hole closest to a side  
13 of said nozzle plate that attaches to said substrate and a conical shaped portion on a portion of said  
14 chamber-orifice hole closest to a side of said nozzle plate opposite from where said nozzle plate  
15 attaches to said front surface of said substrate, said conical shaped portion being a section of a right  
16 circular cone with an axis perpendicular to said front surface of said substrate and perpendicular to  
17 said surfaces of said nozzle plate.